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ABSTRACT

Contending that previous investigations into the efficacy of underlining as a study technique have yielded mixed results due to the specific experimental methodologies employed, a study addressed the issue by manipulating both the reading comprehension skills of students and the kind of information given to them about underlining. Specifically, the study examined whether providing college students with materials containing textually important information underlined would improve test performance for those materials. Approximately 100 students were arranged into three separate experimental groups. Those in the first group were told to concentrate on knowing the underlined portions of a text and were told that by focusing their study time on those portions they might do better on a test to follow. Students in the second and third groups were instructed to read and study the text as they normally would when preparing for an examination. No mention was made of underlining. Following the reading, each student completed a reading comprehension test and a test of language skills. Results indicated that students given relevant information underlined in the text did not obtain higher scores on the comprehension test than students who had unmarked texts. However, students provided with underlined text spent less time preparing for the subsequent test, and this effect was found to be independent of comprehension skills. (FL)

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DOES PROVIDING UNDERLINED TEXT IMPROVE SUBSEQUENT TEST PERFORMANCE FOR THAT MATERIAL?

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READING ABILITY AND THE IDENTIFICATION OF IDEAS FROM TEXT MATERIALS

ABSTRACT

It was the contention of this paper that previous investigations into the efficacy of underlining as a study technique have yielded mixed results due to the specific experimental methodologies employed. The present study attempted to address this issue by manipulating both the reading comprehension skills of the students and the kind of information given to the students about underlining. This study asked whether providing university undergraduates with textually important information underlined would improve subsequent test performance for those materials.

The results indicated that students provided with relevant information underlined within the text did not obtain higher scores on the text comprehension test than students who were provided with unmarked text materials. However, students provided underlined text spent less time preparing for the subsequent multiple-choice test and this effect was found to be independent of comprehension skills.

It would appear that although underlined text materials in and of themselves did not result in increased comprehension for that material, underlining influenced the amount of time students were willing to commit for study purposes.

Does Providing Underlined Text Improve Subsequent Test Performance for that Material?

Reading a textbook in preparation for a test is somewhat different from reading the Sunday paper, a favorite magazine, or a well written novel (Anderson, 1980). Reading a novel may be viewed as a recreational or leisurely endeavor, but reading a textbook tends to be more academically orientated. To put it another way, very few people would consider reading a textbook just for the fun of it and many people would be surprised to receive a pop quiz over the information which appeared in last night's newspaper.

Much of formal education requires students to actively learn from text materials. It is generally assumed that students who utilize techniques such as underlining, outlining, note taking, or summarizing while studying will tend to learn more than if such techniques were not implimented (Stordahl & Christensen, 1956). Similarly, it is often assumed that students do not venture into activities such as reading, reviewing, and studying text material haphazardly, but with an intent to organize the material in such a manner that maximizes learning.

It would seem that, the closer the correspondence between the students' and instructor's judgments as to what constitutes important information, the greater the probability of a better grade on the test. Thus it would be to the students' advantage to pay particular attention to textually highlighted information presented in the text

and/or to the information the instructor focused upon during lecture while studying. Research examining individual differences in study methods utilized by students who vary in reading comprehension skills is lacking. Therefore it is extremely difficult to attribute empirically the source of academic failure among these students to either poor study habits and/or poor reading comprehension skills.

Prior investigations into the efficacy among study techniques generally converge on two major points. First, when more than enough study time is provided, students' performance on subsequent tests measuring comprehension for that material has been equivalent regardless of study technique (Strodahl & Christensen, 1956; Idstein & Jenkins, 1972). However, when time limits are imposed that make thorough study difficult, receiving underlined text has been demonstrated to be superior to repetitive reading (Crouse & Idstein, 1972). Second, when intellectual factors (e.g. verbal intelligence or reading comprehension skill) are held constant or otherwise controlled, differences among study techniques typically have not been obtained (Hoon, 1974).

The primary purpose of the present study was to examine whether providing students varying in reading comprehension skills with underlined text materials would produce differential performance on a test of the material. This study was interested in two primary questions relevant to issues in memory. First, do students who differ in reading comprehension skills also differ in terms of the kind of information studied prior to testing? Second, do students

make use of underlining that indicates important information? The basic contention of this study was that previous research failed to examine individual differences in reading comprehension in terms of (a) the amount of time devoted to test preparation, (b) individual differences in the recognition of information varying in its importance, and (c) recognition memory for inferences as well as literal information.

Method

Materials

Text. A seven page, 3755-word selection from an introductory psychology text was selected (Hilgard, Atkinson, & Atkinson, 1979). This selection presented a discussion of two theories of personality, topics not scheduled for lecture until the latter part of the academic term. Thus, the material was relevant to course work and was relatively neutral in that students had little prior knowledge about these topics. Discussion of the psychoanalytic approach covered four pages of the text (approx. 2180 words) and the phenomenological approach was discussed on the remaining three pages (approx. 1575 words).

Importance ratings. Clinical and experimental graduate students in psychology (n = 11) were given individual photocopies of the selection to read. They were told to underline each sentence in terms of how important it was for an undergraduate to know in preparation for a test. Each graduate student was instucted to underline sentences judged

to be highly important in red ink and moderately important sentences in blue ink. Sentences left unmarked would be considered to be of little information value by default. Graduate students were further instructed to keep the three levels of judged importance roughly proportional, i.e. one-third highly important, one-third moderately important, and one-third unimportant. There were no time constraints placed on the graduate students. The frequency with which a sentence was marked as highly important, moderately important, or unimportant determined the importance level of each sentence.

Test construction. Using a multiple-choice format, memory for literal information and inferences was examined for high, moderate, and unimportant information as defined by the graduate students' ratings.

Half of the text comprehension test items required students have knowledge of explicitly stated literal information presented in the text and half required required memory for information inferred from the text. Literal items were those in which the information needed to select accurately from among the alternatives were explicitly stated in the sentence. Inferential items were those in which the information present in the sentence needed to be integrated with other information present either within that sentence or with other sentences in order to select correctly from among the alternatives.

Half of the test items were based on information high in importance, one-fourth on moderately important information,

and one-fourth on low important information. There were a total of 32 test items which were constructed from introductory psychology text sentences based on literal and inferential information at three levels of importance.

Procedure

University undergraduates were tested in small groups of no more than 10 individuals per experimental session. Students in Treatment one (T1) were instructed to concentrate on knowing the underlined portions of the text. They were further informed that by focusing their study time on these portions they should do better on the test since questions based on that material would appear on the test. These instructions appeared twice within the paragraph and were underlined to draw additional attention to their importance. For students in Treatment two (T2) and Treatment three (T3) the explicitly stated instructional paragraph (T1) was replaced with a more general paragraph. Students were instructed to read and study the text as they normally would when preparing for an exam. No mention was made of underlining.

Once the instructions had been read, students removed the text material (T1 and T2) had texts with the highly important sentences underlined and T3 received unmarked copies) from their packets and began to read and study the selection. Students were told that whenever they felt adequately prepared they could put the text back in the packet, remove the test, and begin. Students were given a

maximum of 40 minutes to prepare for the test. All but ten students had already begun the test when the experimenter called time, They were instructed to put the text away and begin the test.

Twenty minutes were allowed for test completion. Students were asked to record their test starting time at the top of the test and their test completion time at the bottom of the last page of the test. A digital clock radio was located in the front of the classroom and was in the line of sight for all students. If they finished before the time limit, students could either check their responses or sit quietly until the hour session was over. At the end of the session students were told that they would be contacted by telephone as to when the Reading Comprehension Test, a subtest of the Descriptive Tests of Language Skills, would be administered. This test is currently being used at kSU as an admissions screening device.

Of the orginal 164 students who participated in the first half on the study, DTLS Reading Comprehension Subtest scores were available for 45 students. The remaining subjects were 129 university undergraduates (36 males and 93 females) enrolled in general psychology. They completed both sessons of this study for partial fullfillment of course requirements. Students were designated as skilled, average, or less skilled in reading comprehension based on performance on the reading comprehension subtest of the DTLS.

Subjects

There were 43 students per treatment with 15 students

in each treatment group at the less skilled and average levels of read ng comprehension and 13 students in each of the skilled reading comprehension groups. As shown in Table 1, there were no differences among the treatment groups in DTLS scores.

Design

The primary design involved two between-subject factors and two within-subject factors. The between-subject factors were study condition (T1, T2, or T3) and level of reading comprehension (skilled, average, or less-skilled). The within-subject factors were information type (literal or inferential) and level of importance (high, moderate, or low).

The design for the ananlsis of study and test times involved two between-subjects factors and one within-subject factor. The between-subject factors were study condition (T1, T2, or T3) and level of reading comprehension (skilled, average, or less-skilled). The within-subject factor was what was being timed (time to read and study or time to complete the test).

Analyses of variance were performed on both designs. Post hoc comparisons between individual means were performed with a Newman-Keuls test. Effects were considered significant at $p \leq .05$.

Results

Multiple-choice test. Comprehension of the experimental text as measured by performance on the multiple-choice test

replicated performance on the DTLS. Skilled comprehenders obtained higher scores than average comprehenders who in turn performed better than less-skilled comprehenders, $F(2,120) = 32.89$, $MSe = 733.49$. The average difference in performance on the experimental test roughly paralleled the average difference in performance on the DTLS (cf. Tables 1 and 2).

Inferential items were answered correctly more often than literal items, $F(1,120) = 73.58$, $MSe = 371.62$, suggesting the possibility that literal information, as represented explicitly in the text, may not be remembered as well as information inferred from the text.

Test items based on moderately important information were answered correctly more often than items based on either highly important or unimportant information, $F(2,240) = 76.96$, $MSe = 371.62$.

Both literal and inferential information classified as moderately important was correctly recognized more often than either highly important or unimportant literal or inferential information, information type-by-importance level interaction. $F(2,240) = 87.77$, $MSe = 399.06$ (see Figure 1). In addition, students tended to do best on inferential questions based on moderately important information. The opposite was true of highly important literal and inferential information. Students tended to perform better on test items based on literal information than on items which required inferential skills.

The Newman-Keuls's analysis performed on the level of comprehension-by-information type-by-level of importance

interaction, $F(4,240) = 2.48$, $MSe = 399.06$, revealed all students were sensitive to the change from highly important to unimportant literal information (see Figure 2). However, only skilled and average comprehenders were sensitive to the change from highly important to moderately important literal information. Unskilled comprehenders' performances did not differ on these two levels of importance. Thus, only skilled and average comprehenders were sensitive to the changes among the three levels of importance among literal information present in expository material. Students with less developed reading comprehension skills were relatively insensitive to the change from highly important to moderately important literal information.

When inferential information type was considered, a different pattern emerged. All students were sensitive to the change from high to moderately important information. However, only skilled comprehenders were insensitive to the change from moderate to unimportant information. Although skilled comprehenders scored significantly higher on high, moderate, and unimportant literal nformation, this same pattern held true for only high and unimportant inferential information. There was no significant difference among students' performances on items based upon moderately important information requiring the use of inferential skills (see Figure 2).

With respect to the treatment condition, neither the main effect of treatment, $F(2,120) = .03$, $MSe = 733.49$, nor

any interactions involving it were significant.

Study and test time. Means of study time and test time are shown in Table 3. Students explictly instructed to study underlined portions of the text spent significantly less time on the material than subjects who received only the underlined material who, in turn, spent significantly less time on the material than subjects who received the unmarked version, $F(2,120) = 11.28$, $MSe = 42.56$. Providing students with underlined materials had an apparent effect on the amount of time they were willing to commit for reading and studying purposes. This result was found to be independent of level of reading comprehension skill. There were no significant differences in the amount of time spent completing the multiple-choice test either among the different treatment groups or among readers varying in comprehension skills.

In order to evaluate the effect that individual differences in study time had on test performance, a reading efficiency score was calculated. Reading efficiency was defined as the number correct on the text comprehension test given the amount of time committed to study. The student's raw score correct served as the numerator and study time served as the denominator: R.E. = Total correct/test preparation time. This score served as the dependent variable in the analysis of variance using treatment condition and reading comprehension skill as between-subject factors.

Students receiving the underlined materials in T1 and T2

obtained higher reading effeciency scores than students serving as controls in T3, F (2,120) = 6.413, MSe = .059, see Table 4. Since the difference in reading efficiency between T1 and T2 was not significant, the results suggest that underlining alone served to promote more efficient reading performance. Both skilled and average comprehenders obtained higher reading effeciency scores than unskilled comprehenders, F (2,120) = 6.448, MSe = .059, see Table 4.

Collectively, providing students with underlined text facilitated comprehension as measured by the amount of information students could learn in the amount of time they were willing to commit to study.

Discussion

One of this study's basic contentions was that previous investigations into the efficacy of underlining as a study technique typically yielded mixed results as a result of experimental methodologies. For example, when study time was equated for variability among text lengths (Arnold, 1942) both repetitive reading and underlining displayed superior trends when compared to outlining and summarizing. However, when study time was sufficiently reduced (Crouse & Idstein, 1972) underlining was superior to repetitive reading. When students were provided ample tudy time (Strodahl & Christensen, 1956; Idstein & Jenkins, 1972) memory for text was equivocal. Similarly, when verbal intellegence (Hoon, 1974) or reading comprehension (Strodahl & Christensen, 1956) was held constant, performance differences among these

techniques were eliminated.

In most study situations, however, it is the students themselves who determine how much time they are willing to commit for study purposes. Therefore, these studies may be compromised by failing to take this factor into account. Within the presented investigation individual differences in the amount of time spent studying was determined both by the primary investigator and by the students themselves. The results of this study indicated that college students who were provided with relevant information underlined within the text did not obtain higher scores on the text comprehension test than students who were provided with unmarked text materials. When sufficient time for study was made available, the results of Strodahl and Christensen (1956) as well as those of Idstein and Jenkins (1972) were replicated. It would appear that although underlined text materials in and of themselves did not result in increased comprehension for that material, underlining had an influence on the amount of time students were willing to commit for study urposes. Students provided with underlined text spent less time preparing for the subsequent multiple-choice test and this effect was found to be independent of comprehension skills.

TABLE 1

DTLS READING COMPREHENSION SCORES

Group	Treatment			
	T1	T2	T3	Mean
Less skilled	30.3	28.2	30.0	29.5
Average	35.9	35.7	35.8	35.7
Skilled	40.4	40.4	40.0	40.5
Mean	35.3	34.4	35.0	

TABLE 2

MEAN PERCENT CORRECT ON THE COMPREHENSION TEST

Source	Mean % correct
Treatment Condition	
T1 - Instruction + Underline	65.3
T2 - Underline only	65.7
T3 - Control	65.3
Reading Comprehension Skill	
Less skilled	55.7
Average	66.8
Skilled	75.1

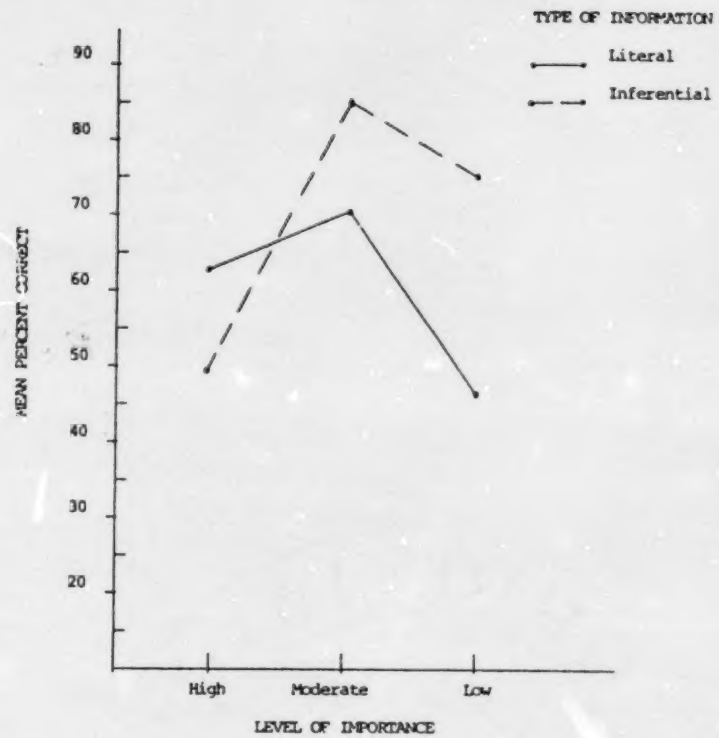

Figure 1: Mean percent correct on the text comprehension test as a function of type of information and level of importance.

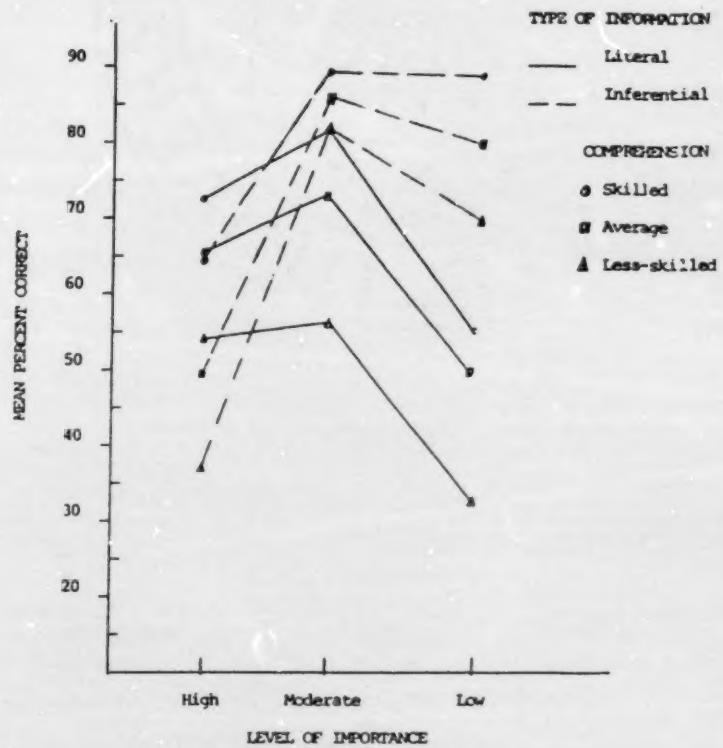

Figure 2: Mean percent correct on the text comprehension test as a function of comprehension, type of information, and level of importance.

TABLE 3

MEAN STUDY AND TEST TIMES (in minutes)

Source	Study Time	Test Time
Treatment Condition		
T1 - Instruction + Underline	26.5	12.0
T2 - Underline Only	29.5	13.0
T3 - Control	33.2	12.7
Reading Comprehension Skill		
Less skilled	29.3	12.7
Average	28.8	12.3
Skilled	31.2	12.7

TABLE 4

READING EFFICIENCY SCORES

Group	Treatment			
	T1	T2	T3	Mean
Less skilled	0.65	0.67	0.54	0.62
Average	0.89	0.76	0.66	0.77
Skilled	0.90	0.81	0.68	0.80
Mean	0.81	0.74	0.62	

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